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EXAMINER	
GUPTA, VANI	

ART UNIT	PAPER NUMBER
3768	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/552,757	AHARONI ET AL.	
	Examiner	Art Unit	
	VANI GUPTA	3768	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 October 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-60* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-60* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *5/24/06; 8/11/10*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 1 is objected to because of the following informalities: in line 1, "structureto" appears to be a typing error. Appropriate correction is required.

2. Claim 39 is objected to because of the following informalities: in line 2, "interset" appears to be a typing error. Examiner has interpreted it to mean "interest" for purposes of examination. However, appropriate correction is sill required.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. ***Claims 1 – 59 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.***

Firstly, the term "duct" in claim 1 is a relative term which renders the claim indefinite. The term "duct" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree. Applicant should note that the coronary artery, where applicants' device is used, is NOT a duct which typically secretes or passes/collects secreted fluid.

This leads to the next issue, that the claim IS requiring that the device be duct-insertable and be an elongated assembly. However, the claim IS NOT limiting as to probe type (e.g., catheter, laparoscope, endoscope, stylet, trocar, needle tip or guidewire).

Thirdly, the claim IS requiring that one or more waveguides are involved. However, it IS NOT insisting what type that the waveguide(s) could be; e.g., optical vs. metal, or even microwave. It also IS NOT limited to the acoustic signal directed radially from the waveguide; i.e., it could also be either endfire or sidefire. It also IS NOT limited to a fiber or fiber-bundle or discrete waveguide set but a 'waveguide assembly'. It also IS NOT excluding of only one waveguide alone or as an 'assemblage' or an assembly of constituent parts of one waveguide.

Fourthly, it IS requiring of at least one transmitter is involved, and however many are involved be 'spaced' along a length of the waveguide(s). However, it IS NOT requiring of an array on transmitters – can be only one transmitter. Furthermore, the claim IS NOT, if a transmit array is involved, requiring that the transmitter characteristics differ but only that the transmitter be independent, which at its broadest, simply means discrete. All can transmit the same signal. Additionally, it IS requiring that plural receivers be involved and also be spaced along a length of the waveguide(s), and IS requiring that the receivers receive reflected echoes. However, it IS NOT insistent as to where along the predetermined length the transmitters and receivers are distributed; i.e., proximally, mid-length or distally along the duct-inserted part. It also IS NOT demanding that the transmitter(s) and receivers be separate, or that the transmitter(s) and the receivers have any spatial relationship to each other at all, such as being co-located, but merely that the latter receive echoes of the acoustic signal from the former.

Furthermore, it IS NOT clear whether the apparatus(es) are limited to transducers, since the claim makes no reference to transduction, but only to transmitters and receivers. Hence, all transducers (which can be acousto-electrical or for example acousto-optical) and sensors – i.e. transmitting and receiving acoustic 'feeds' that do NOT transducer – would be included.

Additionally, it is not clear whether the aforementioned waveguide can effectively BE part of a transmitter and/or receiver, which is discussed below.

Sixthly, it IS requiring that parameters (plural) of the physical structure associated with the duct are determined. However, it IS NOT limited to imaging (could be an A-scan determination?), or that if there is imaging involved, it IS NOT really requiring that anything beyond one or two or three-dimensional imaging be investigated. Since the type of image scanning is being accomplished is not specified, if image scanning is what is being accomplished), then one is not reasonably apprised of what type of parameters of local physical structure the invention is trying to determine. For example, since an A-scan or B-scan echo tells position by echo return delay as an indicator of depth and tells acoustic impedance by reflectivity level or brightness, then position and reflectivity are two parameters of local physical structure (for example, see *Angelsen et al. US 4,887,605* - ***Fig. 5*** where both A-amplitude and position define atheroma and vessel wall).

Without all the aforementioned details, one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

Claims 2 – 29 are rejected as well for the same reasons above, as they are dependent on Claim 1.

Claims 30 – 59 are rejected for the same reasons, as well.

Furthermore, claims 29 and 58 are rejected for including the feature "the elongated structure extends to approximately 30 mm." It is not clear just how much "approximately 30 mm" is. As far as one of ordinary skill in the art could be concerned, this amount could be anywhere from .5 mm to 100 mm. Appropriate correction is required.

4. ***Claim 60 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement.***

Claim 60 contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Essential subject matter such as what a "duct" is; exact details pertaining to arrangement or configuration of the transmitters and receivers; etc. are not clearly defined or described by the specification. Please see above rejection of claims 1 – 59 for more details about what is lacking from the specification.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. ***Claims 1 – 6, 8, 11, 19 - 21, 30 - 35, 37, 48 - 50, 52, rejected under 35 U.S.C. 102(b) as being anticipated by Morantte.***

Regarding claims 1 – 3, *Morantte, Jr.* (hereinafter *Morantte*) discloses a probing device for insertion into a duct *("intra-arterial probe," **(10)**)* having a physical structure to determine local parameters associated with the physical structure of the duct at a selected region of the duct, and in particular variations in the physical structure, along a predetermined length of interest, the probing device comprising:

at least one of a plurality of waveguides *("fibers," **Figs. 4, 5, (62)**)* incorporated in an elongated assembly *("interspersed bundle," **(60)**)* capable of being inserted into the duct;

at least one of a plurality of transmitters – *that is, electrodes **93** cause bundle 62 to operate as a phased array (col. 10, ll. 10 – 14)* – spaced and distributed along a predetermined length of said at least one of a plurality of waveguides incorporated in the elongated assembly - *either pvdf-coated or fiber per se is piezoelectric (col. 6, ll. 24 – 37)* - each capable of independently transmitting an acoustic signal of predetermined characteristics *(i.e., that's what phased array tx does per delay controls)*;

a plurality of receivers - *same bundle **62**, which serves as "the at least one transmitter," discussed above* - spaced and distributed along a predetermined length of said at least one of a plurality of waveguides incorporated in the elongated assembly same as above, each capable of receiving echoes of the acoustic signal, reflected off the structure of the duct *("30 – 45 degree imaging scan," col. 6, ll. 55 - 58)*;

whereby when each of said at least one of a plurality of transmitters generates an acoustic signal, echoes of the signal are received by the plurality of receivers and received data associated with the echoes is processed by a processing unit to determine parameters of the physical structure at the region, *such as 1)location and 2)size of obstruction (col. 10, ll. 10 – 23)*.

Regarding claims 4 and 5, Morantte discloses the device as claimed in Claim 1, wherein each of said at least one of a plurality of transmitters, comprises an absorbing region within an optical fiber, the absorbing region made from material *("piezoelectric material;" col. 4, ll. 48 – 54; col. 7, ll. 18 - 35)*, which is capable of converting optical signals to acoustic signals *(col. 5, ll. 25 – 30; col. 6, ll. 55 – 56; col. 10, ll. 5 – 20).* Additionally, as discussed above, fiber optic bundle is capable of transmitting acoustic energy.

Regarding Claim 6, Morantte discloses the device as claimed in Claim 5, wherein the absorbing regions are made of material that absorbs at different optical spectra, such that at least one of the absorbing regions are activated to generate acoustic signals at a certain optical spectrum, and other absorbing regions are activated to generate acoustic signals at one or more different optical spectra *(col. 9, ll. 1 – 15)*.

Regarding Claim 8, Morantte discloses the device as claimed in Claim 4, wherein each of said plurality of receivers comprises at least one of a plurality of optical fibers capable of allowing light to traverse through *(col. 4, ll. 48 – 50)* and be modulated by the echoes *(col. 5, ll. 25 – 30)*.

Regarding Claim 11, Morantte discloses the device as claimed in Claim 8, wherein at least some of said fibers serving as receivers are staggered along the length of interest to sensitize them to different regions along the length of interest *(col. 6, ll. 29 – 33)*.

Regarding Claim 19, Morantte discloses the device as claimed in Claim 4, wherein each of said plurality of receivers comprises at least one of a plurality of optical fibers through which light can traverse and be modulated by the echoes and which incorporate at least one feature/component capable of acting like wavelength-dependent reflectors, such that each is

capable of effectively limits extent of a certain optical wavelength traveling in the fiber *(see rejection of claim 8; col. 5, ll. 19 – 25)*; the position of at least some of these reflecting elements is distributed along the length of the interest, sensitizing each wavelength to a different positions along the length of interest *(col. 6, ll. 29 – 33)*.

Regarding Claim 20, Morantte discloses the The device as claimed in Claim 19, wherein the received signals are capable of being processed *(col. 8, ll. 57 – 65)* to account for the different phases in each receiver *(col. 10, ll. 11 – 13)* in conjunction with a knowledge of physical separation between the receivers *(col. 6, ll. 28 – 32)* capable of effecting a circumferential resolution in the device *(col. 6, ll. 28 – 32)*.

Regarding Claim 21, Morantte discloses the device as claimed in Claim 1, wherein each of said at least one of a plurality of transmitters, comprises at least one absorbing region within a multicore optical fiber *("fiberoptic bundle,"* ***fig. 5, #60*** *comprising a number of fiberoptic fibers,* ***fig. 4, #62****)*, the absorbing region made from material, which converts optical signals to acoustic signals *(please see rejection of claims 4 – 5)*, and wherein at least one of the cores serve as at least one receiver *(please see rejection of claim 1)*.

Regarding claims 30 - 32, Morantte discloses a probing device for insertion into a duct having a physical structure to determine local parameters associated with the physical structure of the duct at a selected region of the duct, and in particular variations in the physical structure along a predetermined length of interest, the probing device comprising:

an elongated assembly *("interspersed bundle,"* ***(60))*** designed to be inserted into the duct *("intra-arterial probe,"* ***(10))***;

a plurality of transmitters, *that is, electrodes **93** cause bundle 62 to operate as a phased array (col. 10, ll. 10 – 14),* spaced and distributed along a predetermined length of said elongated assembly, *either pvdf-coated or fiber per se is piezoelectric (col. 6, ll. 24 – 37),* each capable of independently transmitting an acoustic signal of predetermined characteristics *(i.e., that's what phased array tx does per delay controls)*;

at least one of a plurality of receivers, *same bundle **62**, which serves as "the at least one transmitter," discussed above,* spaced and distributed along a predetermined length of said elongated assembly, each capable of receiving echoes of the acoustic signal, reflected off the structure of the duct *("30 – 45 degree imaging scan," col. 6, ll. 55 - 58)*;

whereby when each of said plurality of transmitters generates an acoustic signal, echoes of the signal are received by the at least one of a plurality of receivers and received data associated with the echoes is processed by a processing unit to determine parameters of the physical structure at the region *such as 1)location and 2)size of obstruction (col. 10, ll. 10 – 23).*

Regarding Claim 33 and 34, Morantte discloses the device as claimed in Claim 30, wherein each of said plurality of transmitters, comprises an absorbing region within an optical fiber, the absorbing region made from material *("piezoelectric material;" col. 4, ll. 48 – 54; col. 7, ll. 18 - 35)*, which converts optical signals to acoustic signals *(col. 5, ll. 25 – 30; col. 6, ll. 55 – 56; col. 10, ll. 5 – 20).* Additionally, as discussed above, fiber optic bundle is capable of transmitting acoustic energy.

Regarding Claim 35, Morantte discloses the device as claimed in Claim 34, wherein the absorbing regions are made of material that absorbs at different optical spectra, such that at least one of the absorbing regions are activated to generate acoustic signals at a certain optical

spectrum, and other absorbing regions are activated to generate acoustic signals at one or more different optical spectra *(col. 9, ll. 1 – 15)*.

Regarding Claim 37, Morantte discloses the device as claimed in Claim 33, wherein each of said at least one of a plurality of receivers comprises at least one of a plurality of optical fibers through which light can traverse *(col. 4, ll. 48 – 50)* and be modulated by the echoes *(col. 5, ll. 25 – 30)*.

Regarding Claim 48, Morantte discloses the device as claimed in Claim 33, wherein each of said plurality of receivers comprises an optical fiber through which light can traverse and be modulated by the echoes and which incorporates several wavelength-dependent reflectors, such that each effectively limits extent of a certain optical wavelength traveling in the fiber *(see rejection of claim 8; col. 5, ll. 19 – 25)*; the position of these reflecting elements is distributed along the predetermined length of the device, sensitizing each wavelength to a different positions along the assembly *(col. 6, ll. 29 – 33)*.

Regarding Claim 49, Morantte discloses the device as claimed in Claim 48, wherein the received signals are processed *(col. 8, ll. 57 – 65)* to account for the different phases in each receiver *(col. 10, ll. 11 – 13)* in conjunction with a knowledge of their physical separation so as to effect a circumferential resolution in the device *(col. 6, ll. 28 – 32)*.

Regarding Claim 50, Morantte discloses the device as claimed in Claim 30, wherein each of said at least one of a plurality of transmitters, comprises at least one absorbing region within a multicore optical fiber *("fiberoptic bundle,"* ***fig. 5, #60*** *comprising a number of fiberoptic fibers,* ***fig. 4, #62****)*, the absorbing region made from material, which converts optical signals to acoustic

signals *(please see rejection of claims 4 – 5)*, and wherein several of the cores serve as one or more receivers *(please see rejection of claim 1)*.

Regarding Claim 52, Morantte discloses the device as claimed in Claim 50, wherein the cores in the said multicore optical fiber, serving as receivers, include a reflecting element that is capable of effectively limits the extent of each of the receiver cores and sensitizes each on to a different positions along the assembly *(see rejection of claim 8; col. 5, ll. 19 – 25)*.

Regarding Claim 59, Morantte discloses a system for determining local parameters associated with a physical structure of a duct at a selected region of the duct, and in particular their variation of a predetermined length of interest, the system comprising:

at least one of a plurality of waveguiding structures *("fibers," **Figs. 4, 5, (62)**)* incorporated with an elongated assembly *("interspersed bundle," **(60)**)* capable of be inserted into the duct;

a plurality of transmitters, *that is, electrodes **93** cause bundle 62 to operate as a phased array (col. 10, ll. 10 – 14),* spaced and distributed along a predetermined length of said at least one of the plurality of waveguides incorporated with the elongated assembly, each capable of transmitting an acoustic signal of predetermined characteristics *(i.e., that's what phased array tx does per delay controls)*;

at least one of a plurality of receivers, spaced and distributed along a predetermined length of said at least one of the plurality of waveguides incorporated with the elongated assembly, each capable of receiving echoes of the acoustic signal, reflected off the structure of the duct *("30 – 45 degree imaging scan," col. 6, ll. 55 - 58)*;

a processing unit for processing the received echoes *(col. 10, ll. 10 – 23)*

an inherent controller capabilities capable of actuating and controlling the operation of the generator and the processing unit *(col. 8, ll. 36 – 41)*,

whereby when each of said at least one of a plurality of transmitters generates an acoustic signal, echoes of the signal are received by at least one of the plurality of receivers and received data associated with the echoes is processed by a processing unit to determine parameters of the physical structure at the region, *such as 1) location and 2) size of obstruction (col. 10, ll. 10 – 23)*.

Regarding Claim 60, Morantte disclose a method for determining local parameters associated with a physical structure of a duct at a selected region of the duct, and in particular variations in the physical structure along a predetermined length of interest, the method comprising: providing a system comprising: a probing device comprising at least one of a plurality of waveguiding structures incorporated within an elongated assembly designed to be inserted into the duct; at least one of a plurality of transmitters, spaced and distributed along a predetermined length of said at least one of the plurality of waveguiding structures incorporated with the elongated assembly, each capable of transmitting an acoustic signal of predetermined characteristics; and at least one of a plurality of receivers, spaced and distributed along a predetermined length of said at least one of the plurality of waveguides incorporated with the elongated structure, each capable of receiving echoes of the acoustic signal, reflected off the structure of the duct; a processing unit for processing the received echoes; a controller for actuating and controlling the operation of the generator and the processing unit, inserting the probing device within the duct at a desired target; generating an acoustic signal by each of said at least one of a plurality of transmitters; receiving echoes of the acoustic signal; processing data

associated with the echoes by the processing unit to determine parameters associated with a physical structure of a duct at the desired region *(please refer to rejections of claims 1, 30 and 59 as well as corresponding dependent claims, as applicable)*.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. ***Claims 7 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morantte as applied to claims 1, 5, 30, and 34 above, and further in view of Benett et al. (US 5,944,687).***

Regarding claim *7*, Morantte discloses the apparatus as described in claism 1 and 5.

However, Morantte does not suggest specifically the device as claimed in Claim 5, wherein the absorbing regions are made of material selected from the group containing: Copper-doped material with absorption spectrum at about 450nm or shorter wavelengths, Alexandrite-doped material with absorption at about 850nm or longer wavelengths, and Yitterbium-doped material with absorption in the range 1,000-1300nm.

Nonetheless, Benett et al. (hereinafter Benett) teaches earth-doped solid state lasers such as yiterrbium, nd:YAG, and alexandrite *(col. 6, ll. 21 – 26)*.

Accordingly, it would have been prima facie obvious to modify Morantte with Benett, so that one could include a dye laser to output energy that is tunable over a wide portion of ultraviolet light and visible spectrum *(Benett: col. 6, ll. 26 – 57)*.

Regarding Claim 36, Morantte in view of Benett suggests the device as claimed in Claim 34, wherein the absorbing regions are made of material selected from the group containing: Copper-doped material with absorption spectrum at about 450nm or shorter wavelengths, Alexandrite-doped material with absorption at about 850nm or longer wavelengths, and Yitterbium- doped material with absorption in the range 1,000-1300nm.

7. Claims 9, 10, 13 – 16, 23 – 26, 38 – 41, 44 – 46, and 53 – 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morantte as applied to claim 8, 21, 52, 54 above, and further in view of Vardi et al. (US 6,659,957 B1).

Regarding claims 9 and 10, Morantte discloses the apparatus of Claim 1, as described above.

However, Morantte does not suggest specifically that each one of said fibers, serving as a receiver, includes a reflecting element, comprising a Bragg grating optical element, which is capable of effectively limiting the extents of the fiber.

Nonetheless, *Vardi et al.* (hereinafter *Vardi*) teaches a reflecting element ***(fig. 3, #8)*** that reflects light, and wherein the reflecting element comprises a Bragg grating optical element *(col. 3, ll. 55 – 58; col. 4, ll. 7 – 20)*.

Accordingly, it would have been prima facie obvious to modify Morantte with Vardi, so that one may have more flexibility with the fibers *(Vardi: col. 3, ll. 60 – 63)*.

Regarding claims 13, 25, 38, and 54, as discussed above, Morantte in view of Vardi suggests the device as claimed in claims 8 and 21, wherein said cores, serving as receivers *(see rejection of claim 21)*, include two reflecting elements *(Vardi: examples 6 and 7, col. 5, ll. 29 – 63)* and inherently capable of propagating two types of light in each core effectively forming two detection channels *(Vardi: col. 4, ll. 58 – 60)*.

With respect to the two reflecting elements comprising a distal reflecting element and a proximal reflecting element, as discussed above, Vardi suggests the availability of plurality of reflecting elements. In any case, mere duplication of parts such lumen openings are well known within the ordinary skill in the art, and unless a new unexpected results is produced by providing more than one reflecting element, it has no patentable weight. See ***In re Harza****, 274 F.2d 669, 124 USPQ 378 (CCPA 1960)*. Therefore, it would prima facie obvious to modify Morantte in in view of Vardi so that one could provide "unidirectional" measurements (*Vardi, col. 4, ll. 15 - 20)*.

With respect to one reflecting element being distal and the other reflecting element being proximal, Applicant should note that this entails mere arrangement of parts, which does not receive any patentable weight because it would not produce any unexpected results. See ***In re Japikse***, *181 F.2d 1019, 86 USPQ 70 (CCPA 1950)*. Additionally, it is an obvious matter of design choice and within the realm of ordinary skill in the art. See *In re Kuhle, 526 F.2d 553, 188 USPQ 7 (CCPA 1975)*. Nonetheless, it would be prima facie obvious to modify Morantte in view of Vardi to provide such an arrangement so that one could obtain "well distributed" measurements *(Vardi: col. 4, ll. 52 – 63)*.

As discussed above, one reflecting element serves to effectively limit the extents of the core for one of the detecting channel; therefore, two reflecting elements, such as the proximal reflecting element and distal reflecting element is capable effectively limit the extent of the core for the other channel.

Vardi also discusses a differential signal between these two channels which is capable of effecting a sensitive region local to the separation of the two reflecting elements *(col. 6, ll. 5 – 33)*.

Regarding Claim 14, Morantte suggests the device as claimed in Claim 13, wherein at least some of said sensitive local regions are staggered along the length of interest to sensitize them to different regions along the length of interest *(col. 6, ll. 29 – 33)*.

Regarding Claim 15, Morantte suggests the device as claimed in Claim 13, wherein received signals are processed *(col. 8, ll. 57 – 65)* to account for different phases in each receiver *(col. 10, ll. 11 – 13)* in conjunction with a knowledge of physical separation between the receivers *(col. 6, ll. 29 – 33)* capable of effecting a circumferential resolution in the device *(col. 6, ll. 28 – 32)*.

Regarding Claim 23, Morantte in view of Vardi suggests the device as claimed in Claim 21, wherein the cores in the said multicore optical fiber, serving as receivers *(please see rejections of claims 1, 8, and 21)*, include a reflecting element that is capable of effectively limits the extent of each of the receiver cores and sensitizes each on to a different positions along the length of interest *(rejections of claims 9 and 10; col. 6, ll. 29 – 33)*.

Regarding claims 16, 24, 26, 41, 44, and 45, Morantte in view of Vardi suggests the device as claimed in Claim 13, wherein at least one of the two reflecting elements comprises a

Bragg grating optical element *(please see rejections of claims 9, 10, and 23)*; and that effectively limits the extents of the fiber *(see rejection of claim 8; col. 5, ll. 19 – 25)*; and the two channels are differentiated by wavelength *(Vardi: col. 3, ll. 55 – 63)*.

Regarding claims 39 and 46, Morantte in view of Vardi suggests the device as claimed in claims 38 and 44, wherein each of said fibers serving as receivers *(see rejection of Claim 30)* are staggered along the length of interest to sensitize them to different regions along the device *(Morantte: col. 6, ll. 28 – 33)*.

Regarding claim 40, Morantte suggests the device as claimed in Claim 38, wherein the received signals are capable of being processed *(col. 8, ll. 57 – 65)* to account for the different phases in each receiver *(col. 10, ll. 11 – 13)* in conjunction with a knowledge of their physical separation *(col. 6, ll. 28 – 32)* capable of effecting a circumferential resolution in the device *(col. 6, ll. 28 – 32)*.

Regarding Claim 53, Morantte in view of Vardi suggests the device as claimed in Claim 52, wherein the reflecting element 20 comprises a Bragg grating optical element *(please see rejection of claims 9 and 10; and 30)*.

Regarding Claim 55, Morantte in view of Vardi suggests The device as claimed in Claim 54, wherein at least one of the two reflecting elements comprises a Bragg grating optical element, and the two channels are differentiated by wavelength *(please see rejection of claims 9, 10, 30, and 54)*.

8. ***Claims 12 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morantte as applied to claim 11 above, and further in view of Nazarathy et al. (US 5,253,309).***

Regarding Claim 12, Morantte discloses the device of claim 11 as described above.

However, Morantte does not suggest specifically the device as claimed in Claim 11, wherein signals are processed by subtracting signals of two detecting fibers, such that the resulting signal corresponds to their region where the two fibers do not overlap.

Nonetheless, *Nazarathy et al.* (hereinafter *Nazarathy*) teaches an optical transmission system in which two complementary outputs of the modulator are applied to two optical transmission fibers, and at the receiving end of the optical signal transmission line these fibers are connected to a balanced receiver that, in order to combine the two received signals, subtracts one from another by means of a differential amplifier *(col. 7, ll. 5 – 31)*.

Accordingly, it would have been prima facie obvious to modify Morantte with Nazarathy, so that one could avoid common-mode signals such as signals comprising laser intensity excess fluctuations that appear with equal amplitudes and the same polarity as those of interest.

Regarding Claim 47, Morantte in view of Nazarathy suggests the device as claimed in Claim 46, wherein signals are processed by subtracting signals of two adjacent detecting fibers, such that the resulting signal corresponds to their region where the two fibers do not overlap.

9. ***Claims 22 and 51 are rejected under 35 U.S.C. 103(a) as being obvious over Morantte as applied to claims 1 and 21 above, further in view of Wardle et al. (US 5,415,653).***

Regarding claim 22, Morantte discloses the apparatus as described in claims 1 and 21 above.

However, Morantte does not suggest specifically the device as claimed in Claim 21, wherein some of the cores serving to generate the acoustic signals have larger lateral cross section than those serving for detection.

Nonetheless, *Wardle et al.* (hereinafter *Wardle*) teaches a fiberoptic bundle in which there are multiple fibers or strands of different diameters *(col. 6, ll. 40 – 56)*.

Accordingly, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Morantte with Wardle, so that one could maximize on space and acoustic strength generation for optimal performance.

Regarding Claim 51, Morantte in view of Wardle suggests the device as claimed in Claim 50, wherein some of the cores serving to generate the acoustic signals have larger lateral cross section than those serving for detection *(see rejection of Claim 22)*.

10. ***Claims 17, 18, 27, 28, 42, 43, 56, and 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morantte in view of Vardi as applied to claim 13 above, and further in view of Thurman et al. (NPL. Controlling the Spectral Reposnse in Guided-mode Resonanace Filter Design.)***

Regarding claim 17, Morantte suggests the device as claimed in Claim 13 including two reflecting elements, as described above.

However, Morantte in view of Vardi does not suggest specifically, wherein at least one of the two reflecting elements comprises a polarization-dependent reflector, and the two channels are differentiated by polarization.

Nonetheless, *Thurman et al.* (hereinafter *Thurman*) teaches a reflecting element illuminated with “TE or TM polarization” *(Section 1, p. 2, ending of paragraph 2)*, capable of differentiating two channels by polarization.

It would have been prima facie obvious to modify Morantte in view of Vardi with Thurman, so that one could make two-dimensional structures polarization independent *(Thurman: Section 1, p. 2, ending of paragraph 2)*.

Regarding claims 27, 42, and 56, please see rejection of Claim 17.

Regarding Claim 18, Ma suggests the device as claimed in Claim 13, wherein at least one of the two reflecting elements comprises a spatially selective element, reflecting one or more guided modes, and the two channels are capable of being differentiated by guided modes *(Thurman: sections 1 – 5)*.

Regarding claims 28, 43, 57, please see rejection of claim 18.

11. ***Claims 29 and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morantte as applied to claims 1 and 30 above, and further in view of Celliers et al. (US 6,022,309).***

In light of the 35 USC §112 second paragraph rejection above, Examiner interprets "approximately 30 mm" to be anywhere from .5 mm to 100 mm for purposes of examination.

Regarding claim 29, Morantte discloses the elongated structure of Claim 1 as discussed above.

However, Morantte does not suggest specifically that the predetermined length of the elongated structure extends to approximately 30 mm.

Nonetheless, as *Celliers et al.* (hereinafter *Celliers*) explains, a elongated structure such as a fiber may comprises a length running from mm to cm *(col. 6, ll. 28 – 31)*.

Even though Celliers discusses the waveguides of the present themselves, and not the housing (elengaoted structure) itself, Celliers' discusses that the fiber's may be inserted within

vasulature just as the present invention, and provides similar energy-generation capabilities *(col. 5, line 64 – col. 6, line 11; col. 6, ll. 37 – 42)*. Therefore, because these two elongated structures were art recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to also provide an equivalent length for the elongated structure of the present invention as well.

Accordingly, it would have been prima facie obvious to modify Morantte with Celliers, so that one could easily insert the elongated structure into a duct.

Regarding Claim 58, please see rejection of Claim 29.

Conclusion and Communication

Any inquiry concerning this communication or earlier communications from the examiner should be directed to VANI GUPTA whose telephone number is (571)270-5042. The examiner can normally be reached on Monday - Friday (8:30 am - 5:30 pm; EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Long Le can be reached on 571-272-2083. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/V. G./
Examiner, Art Unit 3768

/Tse Chen/
Supervisory Patent Examiner, Art Unit 3737/3768